



## ***Supplemental Fact Sheet: Glen Canyon Dam High-Flow Experiment***

### **HUMPBACK CHUB EXPERIMENTS**

The high-flow test experiment will advance understanding of the dynamics of the Colorado River ecosystem while providing tangible benefits to the fishery, river environment and recreational users in Grand Canyon National Park.

A major portion of the high-flow test research focuses on the well-being of native fish. The endangered humpback chub, one of four remaining native fish in the Grand Canyon, is dependent upon the Canyon's habitat and has evolved with flood events.

Scientists will conduct a hoop-net survey to examine the affect of this high flow on juvenile humpback chub near the confluence of the Little Colorado River. Recent surveys showed a high number of juvenile chub in this reach. The 2004 reproduction year yielded some of the largest catches of young-of-the-year chub in many years.

This survey is needed to ensure that scientists understand how the timing of this high flow may have affected young humpback chub around the mouth of the Little Colorado River. It is hypothesized that because the chub evolved under the highly flood-prone conditions of the Colorado River, they will not be negatively affected by this experimental high flow, but this needs to be tested to be sure.

The humpback chub is a native fish that evolved around 3 to 5 million years ago. It is a member of the minnow family and lives primarily in canyon sections of rivers where water currents are swift and turbulent.

It has a pronounced hump behind the head, large fins, olive-colored back, silver sides, white belly, small eyes, and a long snout that overhangs the jaw. Humpback chub may live more than 30 years in the wild and can grow to nearly 20 inches in length.

The U.S. Fish and Wildlife Service listed the humpback chub as an endangered species in 1967. Critical habitat was designated for portions of the Colorado, Little Colorado, Green and Yampa rivers in Arizona, Colorado and Utah.

In the Lower Colorado River Basin, a large humpback chub population occurs in the Grand Canyon. In the Upper Colorado River Basin (above Glen Canyon Dam), the largest populations occur in the Colorado River near the Colorado-Utah border and in Desolation/Gray canyons on the Green River in Utah. Smaller populations occur in the Yampa River in Colorado and Cataract Canyon on the Colorado River in Utah.

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## **OTHER BIOLOGICAL EXPERIMENTS**

Endangered Southwestern willow flycatchers are migratory birds that are presently on their South American winter grounds.

Previous experimental flows resulted in sediment deposition that promoted growth of riparian vegetation that is favored by flycatchers, who build their nests along Southwestern rivers during the summer months. The Lower Colorado River has been proposed as critical habitat for the flycatcher.

Another endangered species, the Kanab ambersnail, is the focus of an experiment to determine if the snail's habitat can be protected from experimental floods. As a result of mitigation for previous experimental flows, agencies have successfully established an additional endangered Kanab ambersnail population at Upper Elves Chasm.

At Vasey's Paradise, up to 120 square meters of the ambersnails' monkeyflower habitat may be lost due to high experimental flows. Therefore, up to 48 square meters of that vegetation habitat will be removed by hand -- similar to sod-cutting -- stacked on pallets and moved above the flood.

After the high flow ends, the vegetation will be relocated to the flood zone, and growth hormones will be applied to plants to encourage re-establishment of snail habitat.

Non-native rainbow trout are an important resource for anglers in the first 15 miles below Glen Canyon to Lees Ferry. Surveys of relative abundance of trout were recently completed by the Arizona Department of Fish and Game. Surveys will be repeated in mid-December to determine the effect of flows on trout populations and trout diet.

The aquatic foodbase is important for all species living in the river. A fundamental component of the foodbase is "drift" or the floating array of invertebrates, algae and other bits and pieces of raw material carried down the river as a result of the natural erosion of the channel and surrounding landscape. Drift provides a source of energy and carbon to higher organisms, including fish.

Drift samples will be taken below the Little Colorado River to determine changes in the foodbase before, during and after the flood. Pre- and post-flood surveys of algae and aquatic vegetation beds, an important part of the foodbase, will also be conducted in the Lees Ferry reach.

Another part of an overall experiment to test the effect of flow and nonflow actions that enhance and restore natural resources in the canyon involves the removal of non-native fish from a critical habitat for the endangered humpback chub near the confluence with the Little Colorado River. While unrelated to flows, this research effort will continue in concert with the overall research design.



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### **ANTICIPATED EFFECTS ON GRAND CANYON NATIONAL PARK**

All cultural resources between the river and 45,000 cubic-feet-per-second were mitigated prior to the 1996 test flow of 45,000 cfs to fulfill federal agency responsibilities for any impacts sustained as a result of the proposed experimental flow. The current experimental flow of 41,000 cfs will not have a direct adverse effect on additional historic properties.

Indirect effects on historic properties will be positive. The intention of the flow is to redistribute sediment onto the terraces (beaches, sandbars) and into drainage channels adjacent to the river.

This operation should raise the river's current base level and increase the amount of fine-grained sediments available for eolian (wind) transport, which will enhance the upper terraces and infill the drainage channels. These processes are necessary for the preservation of historic properties.

Cultural resources that would be improved indirectly by this test flow include historic properties (sites eligible for listing on the National Register of Historic Places). These sites date mainly 1000 to 1200 A.D. and represent the Cohonina and Puebloan cultures (modern Pueblo Indians (Hopi and Zuni) and ancestors to the Hualapai, Havasupai and Southern Paiutes.

Other cultural resources include Traditional Cultural Places and sacred sites, including springs, specific geographical locations for mineral collections, and plant-collecting areas. These are important to the tribes' cultural affiliation to the Canyon.

Regarding effects on beaches, the size, abundance, and distribution of the sand deposits that serve as campsites limit the river's recreational carrying capacity within Grand Canyon National Park.

The high-flow experiment is designed to deliver sediment that has been deposited into the Colorado River from the Paria River and other tributaries to higher elevations, thus rebuilding camping beaches and improving recreational opportunities.

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